

STATE OF ALASKA

Bill Sheffield, Governor

Annual Performance Report for  
PASAGSHAK RIVER CHINOOK SALMON DEVELOPMENT

by

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## RESEARCH PROJECT SEGMENT

State: Alaska

Name: Sport Fish  
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Project: F-10-1

Study: S-41

Study Title: KODIAK CHINOOK SALMON  
STUDIES

Job: S-41-3

Job Title: Pasagshak River  
Chinook Salmon  
Development

Cooperator: John B. Murray

Period Covered: July 1, 1985 to June 30, 1986

## ABSTRACT

A total of 79,404 juvenile chinook salmon, *Oncorhynchus tshawytscha* (Walbaum), of Lake Rose Tead origin were stocked in Lake Rose Tead on June 5, 1985. Spawning ground surveys and a creel census indicated a minimum of 59 adult chinook salmon returned from previous chinook fingerling plants. Ten of 20 adult chinooks sampled for age-growth data were Age 1.4 fish that returned from 93,259 fingerlings stocked in 1980. Approximately 5,000 Lake Rose Tead chinook salmon eggs were taken for stocking in 1986. An additional 95,000 eggs were naturally deposited in the Lake Rose Tead system. A summary of chinook salmon stocking and adult returns between 1976 and 1985 is presented.

## KEY WORDS

Chinook, salmon, fingerling, stocking, return, harvest, Pasagshak, Alaska.

## BACKGROUND

The Pasagshak River/Lake Rose Tead system (Figure 1) is located on Kodiak Island, Alaska, 64 km southwest of the City of Kodiak. The lake contains 946 ha, is 4.6 m deep, has nine inlets (basically spring fed), and drains 23.3 km<sup>2</sup>.

The goal of stocking chinook salmon fingerlings into Lake Rose Tead was to produce an annual run of 300 to 500 chinook salmon that, in turn, would provide 5,000 to 10,000 days of angler effort. Chinook salmon populations do not exist along the northeast Kodiak Island road system.

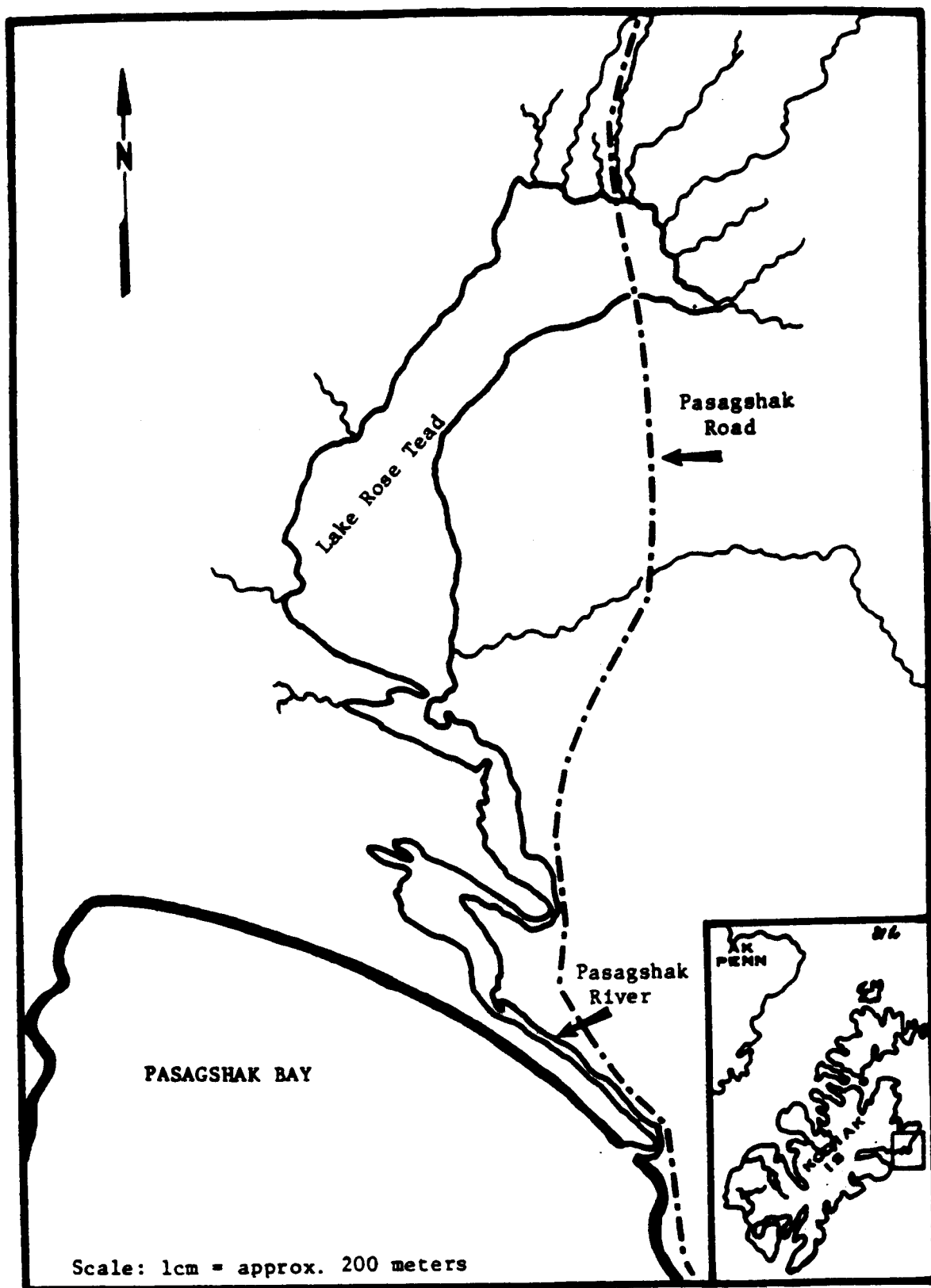


Figure 1. Pasagshak River/Lake Rose Tead system, Kodiak Island.

In addition, little freshwater sport fishing is available near the City of Kodiak during early summer. Establishment of a new chinook salmon population would provide large, trophy-sized fish and fill a void in the early summer sport fishery.

Lake Rose Tead was selected for experimental chinook fingerling plants because it appeared to have available salmonid rearing habitat, there were few commercial fishery and subsistence fishery management conflicts, and it was easily accessible to 90% of the Kodiak area residents. The salmon rearing habitat of Lake Rose Tead was dramatically increased by the March 27, 1964 earthquake, which lowered the lake (1.7 m) to near sea level. Consequently, the lake now receives tidal salt-water intrusion which has created a rich marine estuary. Lake Rose Tead historically contained a spawning population of 300-500 coho salmon, which dramatically increased to 3,500 fish after the earthquake. This dramatic increase probably resulted from improved environmental rearing conditions. Other native fish include, but are not limited to, sockeye salmon, pink salmon, chum salmon, Dolly Varden, threespine stickleback, marine sculpins, starry flounder and smelt.

Lake Rose Tead spawning habitat is probably ideal for coho salmon but marginal for chinook salmon. Therefore, hatchery produced chinook fingerlings will probably be necessary to provide a viable sport fishery.

Chignik River chinook salmon were selected as a brood stock for the experimental project as they spawn and rear in an intertidal habitat similar to the Pasagshak River/Lake Rose Tead system. Between 1976 and 1985, chinook salmon stocking (Table 1) ranged from a low of 14,261 smolts (1978) to a high of 156,898 fingerlings (1983). Progeny from the initial plants were stocked in 1982 (n=29,950 fingerlings), 1983 (n=37,399 fingerlings), 1984 (n=5,857 fingerlings), and 1985 (n=79,404 fingerlings). Observed adult chinook returns from previous fry plants ranged from four fish in 1979 to 80 fish in 1981.

Table 2 presents a list of the fishes observed or studied in this report.

#### RECOMMENDATIONS

1. The stratified, random creel census should be discontinued on Pasagshak River and replaced with a spot creel census to determine the relative sport harvest of chinook salmon.
2. Chinook salmon escapement surveys should be conducted on Lake Rose Tead to determine relative success of previous chinook salmon fingerling plants.
3. If a significant adult chinook salmon return occurs in 1986, a chinook salmon egg take should be conducted to collect a maximum of 200,000 green eggs for restocking the lake.

Table 1. Lake Rose Tead Chinook Salmon Stocking History and 1978-1985 Observed Adult Returns.

Year Stocked	Number of Fish Stocked	Origin	Fingerling Size (#/kg)	Observed Adult Return by Year								Total
				1978	1979	1980	1981	1982	1983	1984	1985	
1976	22,500	Chignik	1,430	0	0	0	3	...	...	...	...	3
1977	133,109	Chignik	1,130	...	3	5	36	49	...	...	...	93
1978	14,261	Chignik	77	...	1	0	1	0	0	1	...	3
1979	65,652	Chignik	980	...	...	0	1	8	10	36	0	55
1980	93,259	Chignik	685	...	...	...	0	0	0	1	10	11
1981	134,784	Chignik	808	...	...	...	...	0	0	0	3	3
1982	96,756*	Chignik	1,399	...	...	...	...	...	0	1	7	8
	29,950*	Rose Tead	1,555									
1983*****	119,499**	Chignik	1,101	...	...	...	...	...	...	0	0	0
	37,399**	Rose Tead	969	—	—	—	—	—	—	—	—	—
1984*****	70,809***	Chignik	918	Subtotal	0	4	5	41	57	10	39	176
	5,857***	Rose Tead	1,724	Unageable	0	0	6	39	0	26	31	141
1985*****	19,922****	Rose Tead	870	Grand								
	59,482	Rose Tead	1,754	Total	0	4	11	80	57	36	70	317

\* 11,657 Pasagshak KS and 11,656 Chignik KS fingerlings were coded-wire tagged in 1982.

\*\* 15,661 Pasagshak KS and 14,670 Chignik KS fingerlings were coded-wire tagged in 1983.

\*\*\* 5,259 Pasagshak KS and 16,745 Chignik KS fingerlings were coded-wire tagged in 1984.

\*\*\*\* A total of 31,707 Pasagshak KS fingerlings were coded-wire tagged in 1985

\*\*\*\*\* Fingerlings were stocked into a 3 m x 3 m x 3 m holding pen and fed Oregon Moist Pellets for 6 days.

1983 and 1984 fingerlings weighed 718/kg and 714/kg, respectively, when released from the pens.

1985 fingerlings; size 870/kg and size 1,754/kg weighed 695/kg and 1,370/kg, respectively when released from the pens.

Table 2. List of Common Names, Scientific Names and Abbreviations  
Used in this Report.

Common Name	Scientific Name and Author	Abbreviation
Chinook salmon	<i>Oncorhynchus tshawytscha</i> (Walbaum)	KS
Chum salmon	<i>Oncorhynchus keta</i> (Walbaum)	CS
Coho salmon	<i>Oncorhynchus kisutch</i> (Walbaum)	SS
Dolly Varden	<i>Salvelinus malma</i> (Walbaum)	DV
Pink salmon	<i>Oncorhynchus gorbuscha</i> (Walbaum)	PS
Starry flounder	<i>Platichthys stellatus</i> (Pallus)	SF
Sculpin	<i>Cottus</i> sp	Sc
Sockeye salmon	<i>Oncorhynchus nerka</i> (Walbaum)	RS
Smelt	Osmeridae family	SM
Threespine stickleback	<i>Gasterosteus aculeatus</i> Linnaeus	TS

4. Pasagshak River and Lake Rose Tead should be closed to sport fishing for chinook salmon in 1986 to provide a maximal chinook salmon escapement.

#### OBJECTIVES

1. To develop an adult return of 300-500 chinook salmon in the Pasagshak River/Lake Rose Tead system and to provide 5,000 to 10,000 days of angler effort for large, trophy-sized chinook salmon that are accessible from the Kodiak road system.
2. To determine the sport harvest and escapement of chinook salmon in the Lake Rose Tead system.
3. To collect up to 175,000 green eggs from Lake Rose Tead chinooks for restocking the lake.
4. To determine the relative survival of eggs naturally deposited by chinook salmon in the Lake Rose Tead system.
5. To determine the relative number of chinook salmon of Pasagshak/Lake Rose Tead origin that are intercepted in the subsistence and commercial fisheries.

#### TECHNIQUES

Chinook salmon fingerlings (n=79,404, Lake Rose Tead origin) were transported in a 265-liter aerated fish-transport tank from the Kitoi Bay Hatchery by a Cessna 206 airplane. The fingerlings were held in the lake in a 3- X 3- X 3-m floating net pen for 6 days and fed Oregon Moist Pellet 10 times daily prior to liberation. A total of 31,707 fingerlings were marked with coded-wire tags.

Sport fish harvest estimates were determined by a stratified, random creel census on Pasagshak River. Four weekdays in a 2-week period were randomly selected without replacement, and a census was conducted every weekend day for 4 hours. The fishing day (16 hours) was divided into four 4-hour blocks and randomly assigned to the weekdays and weekend days without replacement. During the census, angler counts were made each hour, and angler interviews were conducted between the counts. Information collected from each completed angler included total hours fished, number and species of fish retained, and age-growth data from the fish.

Fish escapement counts were made by foot, boat and aerial surveys of the Pasagshak River system.

Lake Rose Tead chinook salmon brood stock were collected with two 45- X 2.4-m beach seines. The eggs were taken surgically, dry fertilized, water hardened for 1-2 hours and transported by single-engine aircraft to the Kitoi Bay Fish Hatchery for incubation and rearing.



Chinook salmon spawning areas in Lake Rose Tead were sampled with a pink salmon pre-emergent pump. A 4-hp outboard motor was operated adjacent to the net trap to create a current for flushing eggs into the cod-net.

Adult chinook salmon were aged by projecting scales (from the preferred scale area) on a Bruning 220 microfiche projector. Salmon ages were coded for brevity, as discussed by Koo (1962).

## FINDINGS

### Results

#### Chinook Salmon Stocking:

Chinook salmon have been stocked annually in the Lake Rose Tead system (Table 1) since 1976. Fish stocked between 1976 and 1981 were of Chignik origin, and both Chignik and Lake Rose Tead fish were stocked from 1982 to 1984 (Van Hulle and Murray 1977, 1978, 1979, 1980, 1981; Murray 1982, 1983, 1984, 1985). A total of 79,404 chinook salmon, including 1.15- and 0.57-g fish ( $n=19,922$  and  $n=59,482$ , respectively), of Lake Rose Tead origin were stocked into that lake on June 5, 1985. Coded-wire tags (CWT) were placed in 31,707 fingerlings; the adipose fin of each CWT fish was clipped to signify the presence of a tag. Prior to liberation, the large and small fingerlings were held in separate 3- X 3- X 3-m net pens and fed Oregon Moist Pellet (10 times daily for 6 days). On June 11, 1986, two 500-fish grab samples were made; the large fish weighed 719 g (1.44 g/ea) and the small fish 365 g (.73g/ea). No measurable mortality of the chinook fingerlings was observed during the 6-day holding period.

#### Chinook Redd Sampling:

Chinook salmon spawning areas on the west shore of Lake Rose Tead (originally observed in mid-September 1984) were sampled with a pink salmon pre-emergent pump on July 12, 1985. The spawning redds were marked with rock piles for identification and egg pumping in 1985. However, environmental elements (ice) during the winter apparently removed the identification markers. Site selection of the redds was therefore based on areas that appeared to be redds; e.g., gravel mounds and clean gravel. Egg pumping was conducted after fry emergence so as not to cause fry and egg mortality. The total number of dead eggs and egg shells was to be used as an index of egg survival. A total of 10 digs in the preferred areas produced no dead eggs or egg shells. Therefore, either site selection was inaccurate or the chinook salmon made pseudo redds and deposited their eggs elsewhere in the lake system.

#### Harvest:

Streamside or spot creel censuses have been conducted on the Pasagshak River system since 1979 to assess angler effort and number of sport caught chinook salmon (Van Hulle and Murray 1980-1981; Murray 1982-1985). A stratified random creel census conducted on Pasagshak

River between June 29 and August 23 indicated 1,950 anglers fished 3,108 hours and retained 32 chinook salmon, 146 pink salmon, 80 coho salmon and 107 Dolly Varden (Table 3). Sport anglers reported or brought in 27 chinook salmon to the Department for sampling (includes one fish caught during a creel census). One subsistence caught chinook was observed in that fishery and a second subsistence caught fish was reported to the Department. A total of 23 fish were reported caught by the commercial fishery in statistical area 259-41, which includes Pasagshak Bay and Ugak Bay.

The subsistence and commercial efforts were considerably less than in prior years because of an increase in waters closed to fishing and fewer days of fishing. During June, July and August the subsistence gill-net markers were moved from 304.7 m to 2.4 km out into Pasagshak Bay, and the commercial fishery was opened for 15 days.

#### Returns:

During June and July 1985, no adult chinook salmon were observed in Lake Rose Tead or Pasagshak River via foot, boat and aerial surveys. Kodiak Island experienced a very cold, late spring, and Pasagshak River was extremely low at midsummer. Therefore, it is presumed that most fish did not in-migrate until the mid-August high tide series, as the first chinook were observed (n=19) during a August 19 aerial survey. On September 16, 30 chinook salmon were observed in the lake and river via a boat and foot survey.

The observed chinook salmon return to Lake Rose Tead was comprised of 27 sport caught fish, 2 subsistence caught fish and an escapement of 30 fish; a total of 59 chinook are known to have returned in 1985. The Pasagshak chinook salmon analyzed for age-growth were comprised of 14 males and 6 females. Scale analysis indicated all fish smolted at Age 1.0; the sample was comprised of Age 1.2 (n=7), Age 1.3 (n=3) and Age 1.4 (n=10) fish. Age 1.4 males (n=6) and females (n=4) had mean lengths of 1,063 and 1,011 mm, respectively.

Fourteen of 23 commercial caught chinook salmon sampled for age-growth data were all sexually immature. Of the various age classes represented in the sample, only nine fish had readable scales; however, four fish had two freshwater annuli, which is atypical for Pasagshak chinook; i.e., all fish (n=176) aged to date smolted at Age 1.0. Origin of the commercial caught chinook is not known, but they appeared to be feeder chinook and not destined for Pasagshak River.

#### Discussion

A comparison of the observed and predicted adult chinook salmon returns for 1978-1985 (see Tables 1 & 4, respectively) shows that fingerling plants of Chignik origin did not produce a significant adult return; e.g., the annual production goal was 300-500 fish. The creel census data presented in Table 3 indicate that the goal of 5,000-10,000 days of angler effort was not achieved. Consequently, stocking Chignik origin chinook fingerlings was not successful in producing a viable sport

Table 3. Pasagshak River Sport Harvest as Determined by a Streamside Creel Census, June 29 through August 23, 1985.

Harvest Period	Angler Trips	Angler Hours	Fish Harvest			
			Dolly Varden	Pink Salmon	Coho Salmon	Chinook Salmon
June 29-July 12	384	489	17	0	0	0
July 13-July 26	342	365	30	4	0	0
July 27-Aug. 9	656	1,219	28	118	46	32
Aug. 10-Aug. 23	<u>568</u>	<u>1,035</u>	<u>32</u>	<u>24</u>	<u>34</u>	<u>0</u>
Total (Partial Season)	1,950	3,108	107	146	80	32

Table 4. Predicted Returns of Pasagshak Chinook Salmon Based on 0.3% and 0.6% Survival of Stocked Fingerlings, 1979-1985.

Potential Return by Year and Age Class*																
Year	Number Stocked	Return** from Stocking	1979		1980		1981		1982		1983		1984		1985	
			Number	Age	Number	Age	Number	Age	Number	Age	Number	Age	Number	Age	Number	Age
1976	22,500	68	11	1.2	32	1.3	20	1.4								
1977	133,109	399	30	1.1	63	1.2	189	1.3	117	1.4						
1978	14,261***	214	16	0.1	34	0.2	101	0.3	63	0.4						
1979	65,652	197					15	1.1	31	1.2	93	1.3	58	1.4		
1980	93,259	280							21	1.1	44	1.2	132	1.3	83	1.4
1981	134,784	404									30	1.1	64	1.2	191	1.3
1982	126,706	380											28	1.1	60	1.2
1983	156,898	471													35	1.1
1984	76,666	230														
Low	Total**		57		129		325		232		167		282		369	
High	Total****		114		258		650		464		334		564		738	

\* Age composition data are based on Fisheries Research Institute Sampling of the Chignik River chinook salmon population; i.e., Age 1.1 = 7.4%, Age 1.2 = 15.8%, Age 1.3 = 47.3%, Age 1.4 = 29.5%.

\*\* Total return based on 0.3% survival of fingerlings to adults.

\*\*\* Stocked as smolts therefore, return based on 3% survival of fingerlings to adults.

\*\*\*\* Total return based on 0.6% survival of fingerlings to adults.

fishery. However, significant chinook returns could occur in 1986 and 1987: (1) approximately 29,950 and 37,399 chinooks of Lake Rose Tead origin were stocked in 1982 and 1983, respectively; (2) an estimated 69,000 and 124,000 eggs were naturally deposited in 1981 and 1982, respectively; (3) 96,756 and 119,499 Chignik origin fingerlings were stocked in 1982 and 1983, respectively; and (4) resident fish (Lake Rose Tead) usually have a higher return than transplanted fish.

Regulatory measures should be taken in 1986 and 1987 to provide a maximal chinook escapement for restocking Lake Rose Tead. The subsistence markers should remain 2.4 km out in Pasagshak Bay, and the river-lake system should be closed to sport fishing. If more than 300 adults do return, 200,000 green eggs should be taken to stock the system. If less than 300 fish return in 1986 or 1987, fingerling plants should be discontinued in Lake Rose Tead.

#### ACKNOWLEDGEMENTS

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